Salt Lake Community College
MATH 1040 Final Exam Fall Semester 2011
Form E

Name________________________________ Instructor________________________________

Time Limit: 120 minutes

Any hand-held calculator may be used. Computers, cell phones, or other communication devices are not allowed.

This exam has two parts.
- **Part I - Ten multiple choice questions**
- **Part II - Ten open ended questions**

Part I

Instructions: Answer all ten questions. Circle the letter of the most correct answer. No partial credit will be awarded on this part of the examination.

1) A doctor at a local hospital is interested in estimating the birth weight of infants. How large a sample must she select if she desires to be 90% confident that the true mean is within 2 ounces of the sample mean? The standard deviation of the birth weights is known to be 9 ounces.

A) 55 B) 54 C) 53 D) 52

2) In a recent survey, 66% of the community favored building a health center in their neighborhood. If 14 citizens are chosen, find the probability that exactly 6 of them favor the building of the health center.

A) 0.660 B) 0.429 C) 0.167 D) 0.044

3) Before opening a new dealership, an auto manufacturer wants to gather information about car ownership and driving habits of the local residents. The marketing manager of the company randomly selects 1000 households from all households in the area and mails a questionnaire to them. Of the 1000 surveys mailed, she receives 150 back. Determine the type of sampling bias.

A) Undercoverage
B) Response
C) Nonresponse
D) Sampling

4) Determine the sampling technique which is used. At a local technical school, five auto repair classes are randomly selected and all of the students from each class are interviewed. What sampling technique is used?

A) Simple random
B) Convenience
C) Cluster
D) Stratified
E) Systematic

5) The table lists the smoking habits of a group of college students.

Sex	Non-Smoker	Regular Smoker	Heavy Smoker	**Total**
Man	135	36	5	**176**
Woman	187	21	7	**215**
Total	**322**	**57**	**12**	**391**

If a student is chosen at random, find the probability of getting someone who is a man or a heavy smoker. Round your answer to three decimal places.

A) 0.623
B) 0.468
C) 0.198
D) 0.110

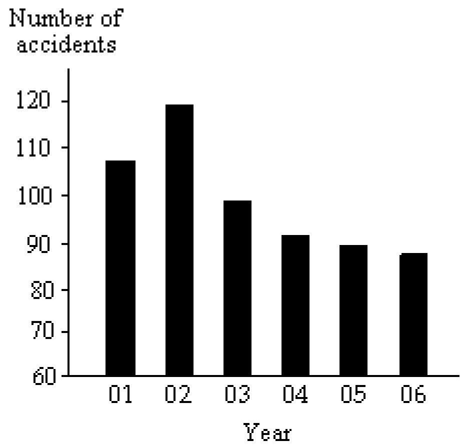
6) Which is **not** a measure of dispersion?

A) Mean
B) Range
C) Variance
D) Standard deviation

7) Suppose that prices of a certain model of new homes are normally distributed with a mean of $150,000. Find the approximate percentage of buyers who paid between $148,700 and $151,300 if the standard deviation is $1300.

A) 34% B) 68% C) 95% D) 99.7%

8) The following graph shows the number of car accidents occurring in one city in each of the years 2001 through 2006. How is the bar graph misleading?



A) The horizontal axis is manipulated such that differences in bar heights appear **larger** than they really are.
B) The horizontal axis is manipulated such that differences in bar heights appear **smaller** than they really are.
C) The vertical axis is manipulated such that differences in bar heights appear **larger** than they really are.
D) The vertical axis is manipulated such that differences in bar heights appear **smaller** than they really are.

9) Investing is a game of chance. Suppose there is a 30% chance that a risky stock investment will end up in a total loss of your investment. Because the rewards are so high, you decide to invest in four independent risky stocks. Find the probability that at least one of your four investments becomes a total loss.

A) 0.7599 B) 0.4116 C) 0.1029 D) 0.0081

10) **Determine whether the situation depicts an observational study or an experiment.**
A medical researcher obtains a sample of adults suffering from diabetes. She randomly assigns 52 people to a treatment group and 52 to a placebo group. The treatment group receives a medication over a period of three months and the placebo group receives a placebo over the same time frame. At the end of three months the patients' symptoms are evaluated.

A) observational study

B) experiment

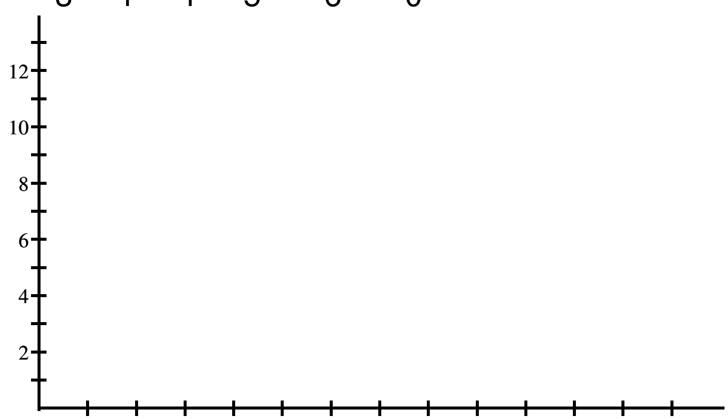
End Part I

Part II

Instructions: Answer all ten questions carefully and completely. Show your work. Clearly indicate your answer. Partial credit may be awarded. Unless otherwise instructed, round answers to two decimal places.

11) Construct the specified histogram. The 30 students in Mrs. Harrison's literature class were asked how many cousins they had. The results are shown below. Create a frequency histogram for the data using 0 as the first lower class limit and a class width of 2. Include appropriate labels.

2	1	3	5	4	7
5	1	0	9	3	1
5	4	1	8	2	11
0	6	3	1	5	7
3	1	1	5	6	0



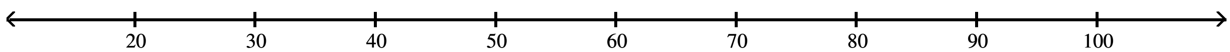
Describe the shape of the distribution. ____________________________

12) The test scores of 30 students are listed below.

21	41	45	48	52	55	56	56	63	65
67	67	69	70	70	74	75	78	79	79
80	81	85	85	85	87	90	92	95	99

Compute the five-number summary. _____ _____ _____ _____ _____

Draw a boxplot that represents the data.



Describe the shape of the distribution. ______________________

13) In a random sample, 10 employees at a local plant were asked to compute the distance they travel to work to the nearest tenth of a mile. The data is listed below.

1.1	5.2	3.6	6.0	4.8	1.8	2.2	5.2	5.1	0.8

Mean __________ Range __________

Sample Standard Deviation _________________

14) A student scores 74 on a geography test and 267 on a mathematics test. The geography test has a mean of 80 and a standard deviation of 5. The mathematics test has a mean of 300 and a standard deviation of 22. If the data for both tests are normally distributed, on which test did the student score better relative to the other students in each class? Show your work.

15) The data below are the average one-way commute times (in minutes) for selected students and the number of absences for those students during the term.

Commute time (min), x	72	85	91	90	88	98	75	100	80
Number of absences, y	3	7	10	10	8	15	4	15	5

Write the equation of the regression line for the given data.

____

What would be the predicted number of absences if the commute time was 95 minutes? Round the predicted number of absences to the nearest whole number. Show your work.

____

Linear Correlation Coefficient ________________(3 decimal places)

Critical Value ___________

Is there a significant linear relation between commute time and number of absences?

___________ Explain:

16) **Claim**: The mean cost of textbooks for one class is less than $180.

H_0 : μ = $180

H_1 : μ < $180

In terms of this situation, explain a type I error.

In terms of this situation, explain a type II error.

17) Construct a 95% confidence interval for the population mean, μ. Assume the population has a normal distribution. A sample of 40 randomly selected English majors has a mean test score of 81.5 with a standard deviation of 10.2.

Calculate the margin of error. Show your work.

____

State the interval. Show your work.

____

Interpret your result.

18) An article in a Florida newspaper reported on the topics that teenagers most want to discuss with their parents. The results of a poll showed that 46% would like more discussion about the family's financial situation, 34% would like to talk about school, and 30% would like to talk about religion. These and other percentages were based on a national random sampling of 507 teenagers. Estimate the proportion of all teenagers who want more family discussions about school using a confidence interval. Use a 95% confidence level.

Calculate the margin of error. Show your work.

____

State the interval. Show your work.

____

Interpret your result.

19) A manufacturer claims that the mean lifetime of its lithium batteries is 1400 hours. A homeowner thinks it may be different from 1400 hours. He randomly selects 40 of these batteries and finds the mean lifetime to be 1370 hours with a standard deviation of 80 hours. Test the manufacturer's claim. Use $\alpha = 0.05$.

Method used: **Classical** or **P-Value** (Circle one)

Null Hypothesis:

Alternative Hypothesis:

Test Statistic:

Critical Value(s) or P-Value (Circle one)

Conclusion about the Null Hypothesis:

Conclusion Addressing the Original Claim:

20) The engineering school at a major university claims that at least 20% of its graduates are women. In a randomly selected graduating class, of the 215 students, 50 were females. Does this suggest that the school's claim is believable? Use $\alpha = 0.05$. Give a detailed argument. Show all the steps.

Chapter 2 Organizing and Summarizing Data

- Relative frequency $= \dfrac{\text{frequency}}{\text{sum of all frequencies}}$
- Class midpoint: The sum of consecutive lower class limits divided by 2.

Chapter 3 Numerically Summarizing Data

- Population Mean: $\mu = \dfrac{\sum x_i}{N}$
- Sample Mean: $\bar{x} = \dfrac{\sum x_i}{n}$
- Range = Largest Data Value − Smallest Data Value
- Population Variance: $\sigma^2 = \dfrac{\sum (x_i - \mu)^2}{N} = \dfrac{\sum x_i^2 - \dfrac{(\sum x_i)^2}{N}}{N}$
- Sample Variance: $s^2 = \dfrac{\sum (x_i - \bar{x})^2}{n-1} = \dfrac{\sum x_i^2 - \dfrac{(\sum x_i)^2}{n}}{n-1}$
- Population Standard Deviation: $\sigma = \sqrt{\sigma^2}$
- Sample Standard Deviation: $s = \sqrt{s^2}$
- ***Empirical Rule:*** If the shape of the distribution is bell-shaped, then
  - Approximately 68% of the data lie within 1 standard deviation of the mean
  - Approximately 95% of the data lie within 2 standard deviations of the mean
  - Approximately 99.7% of the data lie within 3 standard deviations of the mean
- Population Mean from Grouped Data: $\mu = \dfrac{\sum x_i f_i}{\sum f_i}$
- Sample Mean from Grouped Data: $\bar{x} = \dfrac{\sum x_i f_i}{\sum f_i}$
- Weighted Mean: $\bar{x}_w = \dfrac{\sum w_i x_i}{\sum w_i}$
- Population Variance from Grouped Data:

$$\sigma^2 = \frac{\sum (x_i - \mu)^2 f_i}{\sum f_i} = \frac{\sum x_i^2 f_i - \dfrac{(\sum x_i f_i)^2}{\sum f_i}}{\sum f_i}$$

- Sample Variance from Grouped Data:

$$s^2 = \frac{\sum (x_i - \mu)^2 f_i}{\left(\sum f_i\right) - 1} = \frac{\sum x_i^2 f_i - \dfrac{(\sum x_i f_i)^2}{\sum f_i}}{\sum f_i - 1}$$

- Population z-score: $z = \dfrac{x - \mu}{\sigma}$
- Sample z-score: $z = \dfrac{x - \bar{x}}{s}$
- Interquartile Range: IQR $= Q_3 - Q_1$
- Lower and Upper Fences: Lower fence $= Q_1 - 1.5(\text{IQR})$; Upper fence $= Q_3 + 1.5(\text{IQR})$
- Five-Number Summary

  Minimum, Q_1, M, Q_3, Maximum

Chapter 4 Describing the Relation between Two Variables

- Correlation Coefficient: $r = \dfrac{\sum \left(\dfrac{x_i - \bar{x}}{s_x}\right)\left(\dfrac{y_i - \bar{y}}{s_y}\right)}{n-1}$
- The equation of the least-squares regression line is $\hat{y} = b_1 x + b_0$, where $\hat{y}$ is the predicted value, $b_1 = r \cdot \dfrac{s_y}{s_x}$ is the slope, and $b_0 = \bar{y} - b_1 \bar{x}$ is the intercept.
- Residual = observed y − predicted $y = y - \hat{y}$
- $R^2 = r^2$ for the least-squares regression model $\hat{y} = b_1 x + b_0$
- The coefficient of determination, R^2, measures the proportion of total variation in the response variable that is explained by the least-squares regression line.

Chapter 5 Probability

- Empirical Probability

$$P(E) \approx \frac{\text{frequency of } E}{\text{number of trials of experiment}}$$

- Classical Probability

$$P(E) = \frac{\text{number of ways that } E \text{ can occur}}{\text{number of possible outcomes}} = \frac{N(E)}{N(S)}$$

- Addition Rule for Disjoint Events

$$P(E \text{ or } F) = P(E) + P(F)$$

- Addition Rule for n Disjoint Events

$$P(E \text{ or } F \text{ or } G \text{ or} \cdots) = P(E) + P(F) + P(G) + \cdots$$

- General Addition Rule

$$P(E \text{ or } F) = P(E) + P(F) - P(E \text{ and } F)$$

- Complement Rule

$$P(E^c) = 1 - P(E)$$

- Multiplication Rule for Independent Events

$$P(E \text{ and } F) = P(E) \cdot P(F)$$

- Multiplication Rule for n Independent Events

$$P(E \text{ and } F \text{ and } G \cdots) = P(E) \cdot P(F) \cdot P(G) \cdot \cdots$$

- Conditional Probability Rule

$$P(F|E) = \frac{P(E \text{ and } F)}{P(E)} = \frac{N(E \text{ and } F)}{N(E)}$$

- General Multiplication Rule

$$P(E \text{ and } F) = P(E) \cdot P(F|E)$$

- Factorial

$$n! = n \cdot (n-1) \cdot (n-2) \cdot \cdots \cdot 3 \cdot 2 \cdot 1$$

- Permutation of n objects taken r at a time: ${}_nP_r = \dfrac{n!}{(n-r)!}$

- Combination of n objects taken r at a time:

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

- Permutations with Repetition:

$$\frac{n!}{n_1! \cdot n_2! \cdot \cdots \cdot n_k!}$$

Chapter 6 Discrete Probability Distributions

- Mean (Expected Value) of a Discrete Random Variable

$$\mu_X = \sum x \cdot P(x)$$

- Variance of a Discrete Random Variable

$$\sigma_X^2 = \sum (x - \mu)^2 \cdot P(x) = \sum x^2 P(x) - \mu_X^2$$

- Binomial Probability Distribution Function

$$P(x) = {}_nC_x p^x (1-p)^{n-x}$$

- Mean and Standard Deviation of a Binomial Random Variable

$$\mu_X = np \qquad \sigma_X = \sqrt{np(1-p)}$$

- Poisson Probability Distribution Function

$$P(x) = \frac{(\lambda t)^x}{x!} e^{-\lambda t} \qquad x = 0, 1, 2, \ldots$$

- Mean and Standard Deviation of a Poisson Random Variable

$$\mu_X = \lambda t \qquad \sigma_X = \sqrt{\lambda t}$$

Chapter 7 The Normal Distribution

- Standardizing a Normal Random Variable

$$z = \frac{x - \mu}{\sigma}$$

- Finding the Score: $x = \mu + z\sigma$

Chapter 8 Sampling Distributions

- Mean and Standard Deviation of the Sampling Distribution of $\bar{x}$

$$\mu_{\bar{x}} = \mu \quad \text{and} \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

- Sample Proportion: $\hat{p} = \dfrac{x}{n}$

- Mean and Standard Deviation of the Sampling Distribution of $\hat{p}$

$$\mu_{\hat{p}} = p \text{ and } \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

Chapter 9 Estimating the Value of a Parameter Using Confidence Intervals

Confidence Intervals

- A $(1-\alpha) \cdot 100\%$ confidence interval about μ with σ known is $\bar{x} \pm z_{\alpha/2} \cdot \dfrac{\sigma}{\sqrt{n}}$.
- A $(1-\alpha) \cdot 100\%$ confidence interval about μ with σ unknown is $\bar{x} \pm t_{\alpha/2} \cdot \dfrac{s}{\sqrt{n}}$. *Note*: $t_{\alpha/2}$ is computed using $n-1$ degrees of freedom.
- A $(1-\alpha) \cdot 100\%$ confidence interval about p is $\hat{p} \pm z_{\alpha/2} \cdot \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$.
- A $(1-\alpha) \cdot 100\%$ confidence interval about σ^2 is $\dfrac{(n-1)s^2}{\chi^2_{\alpha/2}} < \sigma^2 < \dfrac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$.

Sample Size

- To estimate the population mean with a margin of error E at a $(1-\alpha) \cdot 100\%$ level of confidence: $n = \left(\dfrac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$ rounded up to the next integer.
- To estimate the population proportion with a margin of error E at a $(1-\alpha) \cdot 100\%$ level of confidence: $n = \hat{p}(1-\hat{p})\left(\dfrac{z_{\alpha/2}}{E}\right)^2$ rounded up to the next integer, where $\hat{p}$ is a prior estimate of the population proportion, or $n = 0.25\left(\dfrac{z_{\alpha/2}}{E}\right)^2$ rounded up to the next integer when no prior estimate of p is available.

CHAPTER 10 Testing Claims Regarding a Parameter

Test Statistics

- $z_0 = \dfrac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$ single mean, σ known
- $t_0 = \dfrac{\bar{x} - \mu_0}{s / \sqrt{n}}$ single mean, σ unknown
- $z_0 = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1 - p_0)}{n}}}$
- $\chi_0^2 = \dfrac{(n - 1)s^2}{\sigma_0^2}$

CHAPTER 11 Inferences on Two Samples

- Test Statistic for Matched-Pairs data

$$t_0 = \frac{\bar{d} - \mu_d}{s_d / \sqrt{n}}$$

where $\bar{d}$ is the mean and s_d is the standard deviation of the differenced data.

- Confidence Interval for Matched-Pairs data:

$$\bar{d} \pm t_{\alpha/2} \cdot \frac{s_d}{\sqrt{n}}$$

Note: $t_{\alpha/2}$ is found using $n - 1$ degrees of freedom.

- Test Statistic Comparing Two Means (Independent Sampling):

$$t_0 = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$$

- Confidence Interval for the Difference of Two Means (Independent Samples):

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Note: $t_{\alpha/2}$ is found using the smaller of $n_1 - 1$ or $n_2 - 1$ degrees of freedom.

- Test Statistic Comparing Two Population Proportions

$$z_0 = \frac{\hat{p}_1 - \hat{p}_2 - (p_1 - p_2)}{\sqrt{\hat{p}(1 - \hat{p})}\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}} \quad \text{where } \hat{p} = \frac{x_1 + x_2}{n_1 + n_2}.$$

- Confidence Interval for the Difference of Two Proportions

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$$

- Test Statistic for Comparing Two Population Standard Deviations

$$F_0 = \frac{s_1^2}{s_2^2}$$

- Finding a Critical F for the Left Tail

$$F_{1-\alpha, n_1-1, n_2-1} = \frac{1}{F_{\alpha, n_2-1, n_1-1}}$$

CHAPTER 12 Inference on Categorical Data

- Expected Counts (when testing for goodness of fit)

$$E_i = \mu_i = np_i \quad \text{for} \quad i = 1, 2, \ldots, k$$

- Expected Frequencies (when testing for independence or homogeneity of proportions)

$$\text{Expected frequency} = \frac{(\text{row total})(\text{column total})}{\text{table total}}$$

- Chi-Square Test Statistic

$$\chi_0^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = \sum \frac{(O_i - E_i)^2}{E_i}$$

$i = 1, 2, \ldots, k$

All $E_i \geq 1$ and no more than 20% less than 5.

CHAPTER 13 Comparing Three or More Means

- Test Statistic for One-Way ANOVA

$$F = \frac{\text{Mean square due to treatment}}{\text{Mean square due to error}} = \frac{\text{MST}}{\text{MSE}}$$

where

$$\text{MST} = \frac{n_1(\bar{x}_1 - \bar{x})^2 + n_2(\bar{x}_2 - \bar{x})^2 + \cdots + n_k(\bar{x}_k - \bar{x})^2}{k - 1}$$

$$\text{MSE} = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2 + \cdots + (n_k - 1)s_k^2}{n - k}$$

- Test Statistic for Tukey's Test after One-Way ANOVA

$$q = \frac{(\bar{x}_2 - \bar{x}_1) - (\mu_2 - \mu_1)}{\sqrt{\dfrac{s^2}{2} \cdot \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\dfrac{s^2}{2} \cdot \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$$

Table I

Random Numbers

Row Number	Column Number 01–05	06–10	11–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50
01	89392	23212	74483	36590	25956	36544	68518	40805	09980	00467
02	61458	17639	96252	95649	73727	33912	72896	66218	52341	97141
03	11452	74197	81962	48443	90360	26480	73231	37740	26628	44690
04	27575	04429	31308	02241	01698	19191	18948	78871	36030	23980
05	36829	59109	88976	46845	28329	47460	88944	08264	00843	84592
06	81902	93458	42161	26099	09419	89073	82849	09160	61845	40906
07	59761	55212	33360	68751	86737	79743	85262	31887	37879	17525
08	46827	25906	64708	20307	78423	15910	86548	08763	47050	18513
09	24040	66449	32353	83668	13874	86741	81312	54185	78824	00718
10	98144	96372	50277	15571	82261	66628	31457	00377	63423	55141
11	14228	17930	30118	00438	49666	65189	62869	31304	17117	71489
12	55366	51057	90065	14791	62426	02957	85518	28822	30588	32798
13	96101	30646	35526	90389	73634	79304	96635	06626	94683	16696
14	38152	55474	30153	26525	83647	31988	82182	98377	33802	80471
15	85007	18416	24661	95581	45868	15662	28906	36392	07617	50248
16	85544	15890	80011	18160	33468	84106	40603	01315	74664	20553
17	10446	20699	98370	17684	16932	80449	92654	02084	19985	59321
18	67237	45509	17638	65115	29757	80705	82686	48565	72612	61760
19	23026	89817	05403	82209	30573	47501	00135	33955	50250	72592
20	67411	58542	18678	46491	13219	84084	27783	34508	55158	78742

Table II

Critical Values for Correlation Coefficient

n		*n*		*n*		*n*	
3	0.997	10	0.632	17	0.482	24	0.404
4	0.950	11	0.602	18	0.468	25	0.396
5	0.878	12	0.576	19	0.456	26	0.388
6	0.811	13	0.553	20	0.444	27	0.381
7	0.754	14	0.532	21	0.433	28	0.374
8	0.707	15	0.514	22	0.423	29	0.367
9	0.666	16	0.497	23	0.413	30	0.361

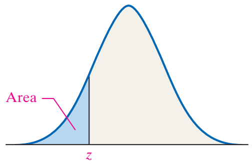


Table V

Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Confidence Interval Critical Values, $z_{\alpha/2}$

Level of Confidence	Critical Value, $z_{\alpha/2}$
0.90 or 90%	1.645
0.95 or 95%	1.96
0.98 or 98%	2.33
0.99 or 99%	2.575

Hypothesis Testing Critical Values

Level of Significance, α	Left Tailed	Right Tailed	Two-Tailed
0.10	−1.28	1.28	±1.645
0.05	−1.645	1.645	±1.96
0.01	−2.33	2.33	±2.575

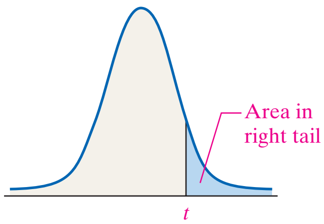


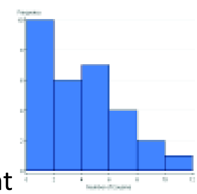
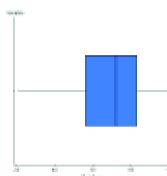
Table VI

t-Distribution

Area in Right Tail

df	0.25	0.20	0.15	0.10	0.05	0.025	0.02	0.01	0.005	0.0025	0.001	0.0005
1	1.000	1.376	1.963	3.078	6.314	12.706	15.894	31.821	63.657	127.321	318.309	636.619
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.089	22.327	31.599
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.215	12.924
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.610	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
31	0.682	0.853	1.054	1.309	1.696	2.040	2.144	2.453	2.744	3.022	3.375	3.633
32	0.682	0.853	1.054	1.309	1.694	2.037	2.141	2.449	2.738	3.015	3.365	3.622
33	0.682	0.853	1.053	1.308	1.692	2.035	2.138	2.445	2.733	3.008	3.356	3.611
34	0.682	0.852	1.052	1.307	1.691	2.032	2.136	2.441	2.728	3.002	3.348	3.601
35	0.682	0.852	1.052	1.306	1.690	2.030	2.133	2.438	2.724	2.996	3.340	3.591
36	0.681	0.852	1.052	1.306	1.688	2.028	2.131	2.434	2.719	2.990	3.333	3.582
37	0.681	0.851	1.051	1.305	1.687	2.026	2.129	2.431	2.715	2.985	3.326	3.574
38	0.681	0.851	1.051	1.304	1.686	2.024	2.127	2.429	2.712	2.980	3.319	3.566
39	0.681	0.851	1.050	1.304	1.685	2.023	2.125	2.426	2.708	2.976	3.313	3.558
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
70	0.678	0.847	1.044	1.294	1.667	1.994	2.093	2.381	2.648	2.899	3.211	3.435
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
90	0.677	0.846	1.042	1.291	1.662	1.987	2.084	2.368	2.632	2.878	3.183	3.402
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
z	0.674	0.842	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.090	3.291

Form E

1. A
2. D
3. C
4. C
5. B
6. A
7. B
8. C
9. A
10. B
11. Skewed Right 
12. 21 56 72 83 99  Skewed Left
13. Mean=3.58 Range = 5.2 s=1.94
14. Z_g=-1.2 Z_m=-1.1 Better on math
15. Y=4.5x-30.3 when x=95 y~12 r=.980
    critical value=.666 Yes, because .980>.666
16. A Type I error would be to conclude the mean is less than $180 when in fact it is equal to $180. A Type II error would be to conclude the mean is equal to $180 when in fact it is less than $180.
17. E=3.26 (78.24, 84.76) We are 95% confident that the …*
18. E=0.04 (0.30, 0.38) We are 95% confident that the …*
19. H_o: μ=1400 H_1: μ≠1400 t_o=-2.37
    Critical values -2.023 & 2.023 **or** p-value=0.02
    Reject H_o. There is sufficient evidence to conclude that the mean is not equal to 1400 hours.*
20. H_o: *p*=0.2 H_1: p>0.2 Critical Value= 1.645 Test Statistic z_o=2.25 Reject H_o. There is sufficient evidence to conclude that more than 20% of the graduates are female.*

*Check for the phrasing you have taught.